

CLAIMS

What is claimed is:

Sub  
a

5

1. A reciprocating fuel pump comprising:  
a housing assembly including a drive section and a pump section;  
a drive assembly disposed in the drive section, the drive assembly including a permanent magnet and a coil assembly having a winding and disposed within the central volume of the drive section adjacent to the permanent magnet and movable reciprocally axially along a central axis upon application of alternating current power to the winding;  
and

10

a pump member secured to and movable reciprocally with the coil assembly, the pump member extending into the pump section to produce pressure variations in the pump section during reciprocal movement to draw fuel into the pump section and to express fuel therefrom.

15

Sub  
b

2. The pump of claim 1, wherein the permanent magnet at least partially surrounds a portion of the central volume and extends generally along a central axis, and wherein the coil assembly is disposed radially within the portion of the central volume.

20

3. The pump of claim 1, wherein the permanent magnet is disposed adjacent to an end of the drive section, and wherein the coil assembly is disposed between the permanent magnet and the pump section.

25

4. The pump of claim 1, wherein the permanent magnet includes at least one magnet elements.

5. The pump of claim 1, wherein the pump member includes a tubular member extending from the coil assembly through a sealed bore into the pump section.

6. The pump of claim 1, wherein the pump section includes an inlet check valve and an outlet check valve, the inlet and outlet check valves being actuated by pressure variations produced by reciprocal movement of the pump member in the pump section.

5 7. The pump of claim 1, further comprising a nozzle in fluid communication with the pump section for expressing pressurized fuel from the pump section.

Sub  
a2  
10 8. A reciprocating fuel pump comprising:  
a resonant drive system including a resonant coil assembly and a permanent magnet, one of the resonant coil assembly and the permanent magnet being disposed in a fixed position and the other of the resonant coil assembly and permanent magnet being movable reciprocally by application of electrical current to the resonant coil assembly, the drive system further comprising a drive member secured to and movable reciprocally with either the coil assembly or the permanent magnet;

15 a pump assembly adjacent to the drive system, the drive member extending into the pump assembly for generating increases and decreases in fluid pressure within the pump assembly during reciprocal movement to draw fuel into the pump assembly and to express fuel therefrom.

20 Sub  
9. The pump of claim 8, wherein the permanent magnet is disposed in a fixed location within the drive system at least partially surrounding a central volume thereof and extending generally along a central axis, and wherein the coil assembly is disposed movably within the portion of the central volume.

25 10. The pump of claim 8, wherein the permanent magnet is disposed in a fixed location adjacent to an end of the drive system, and wherein the coil assembly is disposed between the permanent magnet and the pump assembly.

11. The pump of claim 8, wherein the permanent magnet includes at least one magnet elements.

5 12. The pump of claim 8, wherein the drive member includes a tubular member extending from the coil assembly through a sealed bore into the pump assembly.

10 13. The pump of claim 8, wherein the pump assembly includes an inlet check valve and an outlet check valve, the inlet and outlet check valves being actuated by pressure variations produced by reciprocal movement of the drive member during operation.

14. The pump of claim 8, further comprising a nozzle in fluid communication with the pump assembly for expressing pressurized fuel from the pump assembly.

15 Sub 15 a3 15. A reciprocating pump comprising:  
a drive system including a permanent magnet and a resonant coil assembly, the coil assembly being energizable to cause reciprocal movement of a drive member; and  
a pump assembly disposed adjacent to the drive system, the pump assembly including means for admitting a supply of fluid into an inner volume of the pump assembly, means for pressurizing the inner volume by reciprocal movement of the drive member, and means for expressing pressurized fluid from the inner volume.

25 Sub 16 16. The pump of claim 15, wherein the permanent magnet is disposed in a fixed location within the drive system at least partially surrounding a central volume thereof and extending generally along a central axis, and wherein the coil assembly is disposed movably within the portion of the central volume.

17. The pump of claim 15, wherein the permanent magnet is disposed in a fixed location adjacent to an end of the drive system, and wherein the coil assembly is disposed between the permanent magnet and the pump assembly.

18. The pump of claim 15, wherein the permanent magnet includes at least two magnet elements.

5 Sub 19. The pump of claim 15, wherein the drive member includes a tubular member extending from the coil assembly through a sealed bore into the pump assembly.

10 20. The pump of claim 15, wherein the means for admitting a supply of fluid into an inner volume of the pump assembly includes a check valve biased into an open position and closed by an increase in pressure within the inner volume during operation.

21. The pump of claim 15, wherein the means for pressurizing the inner volume by reciprocal movement of the drive member includes a portion of the drive member.

15 22. The pump of claim 21, wherein the drive member is a tubular element and the means for pressurizing the inner volume includes a valve element which seats to seal an inner passageway of the drive member during a pressure stroke thereof.

20 23. The pump of claim 15, wherein the means for expressing pressurized fluid from the inner volume includes an outlet check valve biased into a closed position and opened by an increase in pressure within the inner volume during operation.

24. The pump of claim 15, further comprising a nozzle in fluid communication with the pump assembly for expressing pressurized fluid from the pump assembly.